AMENDED CLAIMS

received by the International Bureau on 06 September 2005 (06.09.2005): original claims 1-17 have been replaced by amended claims 1-36.

1. A device that increases the rate of reproduction (through increased speed of reproduction and/or increased reproductive yield) of living cells in suspension or of any culturable organisms through the process of natural selection, said device comprising: a) a flexible, sterile tube containing culture medium,
b) a system of clamps, each capable of open and closed positions, the clamps being positioned so as to be able to divide the tube into separate regions containing spent culture (downstream region), growing culture (growth chamber), and fresh growth medium (upstream region),
c) a means of moving the clamps and the tubing such that a portion of the growth chamber and the associated culture can be clamped off and separated from the growth chamber, and such that a portion of fresh tubing containing unused medium can be joined with a portion of the culture and associated medium already present in the growth chamber, wherein each of the clamps does not move with respect to the tube when said clamp is in the closed position.

2. The device according to claim 1, wherein the tubing is flexible to allow clamping and segregation into separated chambers.

3. The device according to claim 1, wherein the tubing is gas permeable, for example comprised primarily of silicon, to allow gas exchange between the cultured organism and the outside environment, according to the type of experiment.

4. The device according to claim 1, wherein the tubing is gas impermeable, to prevent gas exchange between the tubing and the outside environment, if the experiment demands anaerobiosis.

5. The device according to claim 1, wherein the tubing is transparent or translucent, to allow the measurement of turbidity.

6. The device according to claim 1, wherein the growth chamber tubing and associated media and culture can be depressurized or over pressurized relative to ambient atmosphere as necessitated by experimental requirements.

7. The device according to claim 1, wherein the tubing allows the measure of pH of medium by inclusion of a pH indicator in the tubing composition or lining.

8. The device according to claim 1, wherein the growth chamber tubing and associated media and culture can be heated or cooled as appropriate for experiment conditions.

9. The device according to claim 1, wherein the growth chamber tubing and associated media and culture can be kept motionless or agitated by any already known method.

10. The device according to claim 9 wherein the tubing can include one or several stirring bars for agitation purpose.

11. The device according to claim 1 wherein regions of the tubing can be confined in a specific and controlled atmospheric area to control gas exchange dynamics.

12. The device according to claim 1 wherein the growth chamber tubing and associated media and culture can be tilted either downward to remove aggregated cells, or upward to remove air through the functions described in claim 1-c.

13. A method that increases the rate of reproduction (through increased speed of reproduction and/or increased reproductive yield) of living cells in suspension or of any culturable organisms through the process of natural selection, comprising: a) providing an initial culture in the described growth chamber through sterile injection of a starter culture into a sterile tube containing sterile growth medium; b) maintaining growth conditions according to experimental requisites ; c) after a certain period of time and associated growth of the culture, adjusting the position of the described gates so as to move equal portions of fresh medium and of grown culture (respectively) into and out of the region defined as the growth chamber, allowing the remaining portion of grown culture to mix with the introduced portion of fresh medium and continue to grow; d) reproducing steps b) and c) until the end of experiment to achieve continuous culture and selection of variants with increased reproductive rates; e) withdrawing on demand a sample of grown culture from sampling chamber.

14. A method according to claim 13 wherein applying a simultaneous peristaltic movement of the gates, the tubing, and the medium and culture within the tubing, allows provision of a certain quantity of fresh medium to the growth chamber while an equal quantity of culture is isolated and removed through the other extremity of said growth chamber, terminating a growth cycle and starting a new one.

15. A method according to claim 13 wherein an experiment can include as many growth cycles as required by the experimenter without possible contamination of isolated growing chamber and without possible proliferation of a dilution-resistant population.

16. A method according to claim 13 such that during the operations the experimenter can maintain growth conditions according to experimental requisites which may include temperature, pressure, optical density, chemical acidity, agitation and aeration with various gases.

17. A method according to claim 13 wherein a combination of tilting the device and operating agitators leads to an appropriate agitation for mixing the growing culture in order to prevent or repress aggregation of living organisms.

18. A device that increases the rate of reproduction (through increased speed of reproduction and/or increased reproductive yield) of living cells in suspension or of any culturable organisms through the process of natural selection, said device comprising:

a continuous length of flexible, sterile tubing;
a system of clamps positioned at points along a section of the tubing, each of the clamps being positioned and arranged so as to be able to controllably pinch the tubing by putting said clamp into a closed position in which the tubing is divided into separate regions on respective sides of said clamp, the separate regions on respective sides of said clamp being merged back into a single region when said clamp is returned to an open position;
wherein the clamps and tubing are arranged so that the tubing is clamped at first through fourth points along the tubing, defining first through third regions downstream of the first through third points, respectively; and
wherein a volume of the second region delimited by said points two and three is greater than a volume of the first and third regions.
wherein the system of clamps is constructed so that, in a repeating pattern, the tubing is clamped upstream of the first point, the tubing is clamped at a point between the second and third points, and the second point is returned to the open position, thereby subdividing the second region into an upstream portion and a downstream portion, merging the first region and the upstream portion, and thereby defining new first through fourth points and first through third regions.

19. The device according to claim 18, wherein the tubing is gas permeable.

20. The device according to claim 18, wherein the tubing is gas impermeable.

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21. The device according to claim 18, wherein the tubing is translucent.

22. The device according to claim 18, wherein the tubing is transparent.

23. The device according to claim 18, wherein contents of the tubing in the second region can be controllably depressurized or over pressurized relative to ambient atmosphere.

24. The device according to claim 18, further comprising a pH indicator in the tubing.

25. The device according to claim 18, further comprising a heating and cooling device that can control a temperature of contents of the tubing.

26. The device according to claim 18, further comprising an agitator.

27. The device according to claim 26, wherein the agitator comprises at least one stirring bar.

28. The device according to claim 18, wherein regions of the tubing can be confined in a specific and controlled atmospheric area to control gas exchange dynamics.

29. The device according to claim 18, further comprising a device to control tilting of the second portion of the tubing.

30. A method that increases the rate of reproduction (through increased speed of reproduction and/or increased reproductive yield) of living cells in suspension or of any culturable organisms through the process of natural selection, said device comprising steps of:

providing a continuous length of flexible, sterile tubing;

providing a system of clamps positioned at points along a section of the tubing, each of the clamps being positioned and arranged so as to be able to controllably pinch the tubing by putting said clamp into a closed position in which the tubing is divided into separate regions on respective sides of said clamp, the separate regions on respective sides of said clamp being merged back into a single region when said clamp is returned to an open position;

placing culture medium in the tubing;

closing the clamps at first through fourth points along the tubing to define first through third regions downstream of the first through third points, respectively, wherein the volume of the second region delimited by said points two and three is greater than a volume of the first and third regions;

introducing said culturable organism into the second region between the second and third points, and allowing the culture to grow in the culture medium; and

repeating a step that comprises clamping the tubing upstream of the first point, clamping the tubing at a point between the second and third points, and returning the second point to the open position, thereby subdividing the second region into an upstream portion and a downstream portion, merging the first region and the upstream portion, and thereby defining new first through fourth points and first through third regions.

31. The method of claim 30, wherein applying a simultaneous peristaltic movement of the clamps, the tubing, and the medium and the culture within the tubing, allows provision of a certain quantity of fresh said medium to the second region of the tubing while an equal quantity of said culture is isolated and removed through an opposite end of said second region, terminating one growth cycle and starting a new growth cycle.

32. The method of claim 30, further comprising a step of controlling a pressure of contents of the tubing in the second region.

33. The method of claim 30, further comprising a step of controlling a temperature of contents of the tubing.

34. The method of claim 30, further comprising a step agitating contents of the tubing.

35. The method of claim 30, further comprising a step of providing a specific and controlled atmospheric area around the tubing to control gas exchange dynamics.

36. The method of claim 30, further comprising a step of controllably tilting of the second portion of the tubing.